A critical reflection of the current research in online and blended learning

Introduction

In April 2014, I received an email from a colleague, who was an assistant professor at The George Washington University, School of Health Sciences. She was emailing to ask my opinion on research and publication possibilities for her and her colleagues who were in the midst of collecting data on several blended learning development projects. Specifically, she envisioned at least four studies based on data they were collecting on blended learning and communities of practice, blended learning and reflective practice, and blended learning and increased interaction in relation to higher levels of learning.

In May 2014, I was at North-West University in South Africa to lecture and conduct workshops on online and blended learning in higher education. North-West University was under a federal government mandate to expand higher education opportunities to its citizens and had asked the public universities for strategies for doing so. Among the strategies being considered was to expand the use of online and blended learning technologies. The specific topics of my workshops related to conducting research in instructional technology, design of blended learning environments, MOOCs, and technology planning. For the workshop on conducting research in instructional technology, the participants represented a group of fifteen mostly younger faculty who were contemplating conducting studies related to work they were doing in their own courses and with their own students. Their topics related to student outcomes, faculty workload, and blended learning in large section classes. They were interested in and had expertise in qualitative and/or quantitative research methods but had never published in the area of instructional technology.

I mention the above for three reasons. First, I am heartened by the fact that there are many young faculty throughout the world interested in conducting and publishing research on online and blended learning. It is a rapidly growing and dynamic area for research especially on issues of teaching and learning.

Second, it would have been unheard of to consider any of the two scenarios as little as twenty years ago. The Internet was just beginning and no one predicted the rapidity with which it would permeate all aspects of society including education. Since the mid-1990s, a significant change has occurred in the delivery of instruction in schools and colleges throughout the world. Traditional face-to-face courses are being redesigned and augmented by online and blended learning modalities. Teachers and students can meet at any time and in any place to participate in a class. In the United States in 2013, more than seven million students or approximately one-third of the higher education population were enrolled in fully online college courses in 2013. (Allen & Seaman, 2014). Millions of additional college students were enrolled in blended courses. Just in the past six years, the phenomenon of massive open online courses or MOOCs have appeared in higher education that enroll as many as 160,000 international students in a single course.

Third, the popularity in online and blended learning has resulted in part from the fact that adult

students who lead busy lives, who have family responsibilities, and who must work while attending a college, are drawn to the convenience of the digital modalities. The facility and data capture capabilities of online and blended learning have opened up new areas of inquiry that focus on the uniqueness and subtlety of the educational goals, objectives, and strategies of all students including the non-traditional adult population.

The purpose of this article is to review the state of the research that focuses on online and blended learning. This article will not review the extensive literature on this research but will attempt to comment on some of the major developments and issues associated with it.

The waves

For purposes of this article, online learning started with the Internet and World Wide Web. Online learning applications using local and wide area networks existed before the Internet but the primary model that evolved over the past twenty years relies on ubiquitous data communications that are owned and operated routinely by all segments of the population. Today, large percentages of people living in countries throughout the world are using laptops, cell phones, and other portable devices to stay connected with family, friends, and their studies. In the following sections, a review of the development of online learning will be presented as a series of four waves starting in the 1990s.

The 1st wave – 1990s

The 1st Wave of online and blended learning commenced with the establishment of the Internet in the early 1990s. The most common technology of the 1st Wave was based on slow-speed, dial-up modem lines. As a result, many of the earliest online learning courses were text-based and relied heavily on asynchronous learning. Digital multimedia was difficult and time-consuming to develop and was incredibly slow in downloading to student computers. The main pedagogical model was an interactive, asynchronous learning network made popular by the Alfred P. Sloan Foundation's grant program entitled, Anytime/Anyplace Learning. Software such as learning/course management systems were rudimentary and a number of schools had to develop their own course-delivery platforms.

The colleges and universities most interested in online learning development during this decade were those that had established distance education programs using other modalities such as television, radio, and course packs. Public institutions such as Athabasca University, the Penn State World Campus, and the University of Maryland – University College, were early leaders in the development of online learning programs. For-profit colleges such as the University of Phoenix, also invested heavily in developing online learning programs.

The 2nd wave – Early 2000s

By the early 2000s, Internet technology had advanced to the point where many people were able to afford high-speed cable modems and digital subscriber lines (DSL). This enhanced connectivity opened up the possibility of incorporating multimedia (pictures, sound, video) into online learning development. Social media such as blogs, wikis, and Youtube also came on the scene, allowing for greater interaction. Faculty from around the world began sharing learning tools and objects in digital depositories such as Merlot.

Perhaps the most important development of this 2nd Wave was that Internet technology was no longer seen solely as a vehicle for distance education but could be used in mainstream education in almost any class and any subject matter. The predominant pedagogical model of this wave was blended learning, as faculty began to use online facilities to enhance their courses and to replace some seat time in regular face-to-face courses. Courses were designed to take pedagogical advantage of the best of both worlds of fully online and face-to-face modalities.

During this 2nd Wave, many colleges and universities scaled up their online and blended learning activities. Learning/course management systems such as Blackboard, Desire2Learn, and Moodle were acquired. Online, for-profit colleges expanded their programs significantly as venture capital flooded into the sector. While mainstream higher education embraced the blended model, the fully online model continued to be the mainstay of the for-profit colleges mainly because it was cost effective for institutions that did not have brick and mortar campuses. The Education Trust estimated that the for-profit sector in the United States grew 236% from 1998 to 2008 while the public and non-profit sectors grew 21% and 17% respectively. (Lynch, Engle & Cruz, 2010)

The 3rd wave – 2008 to 2013

The term MOOC (Massive, Open, Online Course) was coined in 2008 by Dave Cormier and Bryan Alexander to describe an online course led by George Siemens and Stephen Downes. The course enrolled more than 2,000 students. With this course the 3rd Wave of online learning development began. In 2011 Stanford University offered several MOOCs one of which, led by Sebastian Thrun and Peter Norvig, enrolled more than 160,000 students. Thrun shortly thereafter started Udacity, a company designed to provide MOOC materials to colleges and universities. A few months later, Andrew Ng and Daphne Koller, both from Stanford University, launched Coursera, another MOOC provider. The MOOC model was grounded in improving student access to a higher education and cost effectiveness. The emphasis was surely on "massive" enrollments and courses that were enrolling hundreds of thousands of students attracted deserved attention.

Faculty from prestigious institutions such as Stanford University, Harvard, and the Massachusetts Institute of Technology became associated with the MOOC phenomenon. In turn, MOOCs were glamorized by their founders at Udacity, Coursera, and edX as the technological revolution that would indeed change higher education. Significant investments of capital were made by private investors and venture philanthropies into MOOC companies. As a result, the news media went on a frenzy. The New York Times declared 2012 as "The Year of the MOOC". (Pappano, 2012) Education policymakers and university trustees took notice and thought they had found a solution to their education funding woes.

At the end of 2013, the media's infatuation with MOOCs receded. A major development that spurred a backlash against MOOCs occurred in 2013. California's San Jose State University was the focus of a well-publicized experiment in which several blended learning courses in mathematics and statistics were developed by Udacity and offered in spring 2013. In comparing completion rates and grades, students taking the MOOC courses did not fare as well as students in previous years' face-to-face courses. (Collins, 2013)

Subsequently, in December 2013, Sebastian Thrun, the founder of Udacity, opened the flood gates for criticism in an interview with Fast Company, where he was quoted as saying that he was throwing in the towel and that "we [Udacity] have a lousy product." (Chafkin, 2013)

Actually Thrun may have been too harsh on his company but the quote was out there and doubts about the efficacy of MOOCs grew. Daphne Koller, founder of Coursera, was more moderate in her comments about her own company's MOOC articles. In November 2013, she commented at the Sloan Consortium's Annual Conference that students who have remediation and other learning needs and who lack the basic skills of reading, writing, and arithmetic would probably better be served by face-to-face instruction. (Koller, November 2013) Koller went on to say that MOOC companies should consider the development of more pedagogically sound course materials that can be used in blended online formats rather than fully online formats. In a sense, Coursera and other MOOC providers might rebrand themselves as producers of high-quality content that gives faculty the option as to how to best use their materials, rather than as course providers and developers.

The 4th wave – 2014 ->

The 4th Wave arrived in 2014 wherein blended learning technologies that allow for more extensive and personal faculty interaction are reconciling with well-financed course content as developed by MOOC providers and others that instructors can use as they see fit. The 4th Wave model extends and combines the development of the 2nd Wave (blended learning) and the 3rd Wave (well-designed MOOC content) and incorporates a variety of pedagogical approaches using multiple formats and instructional tools. Social- and multi-media use has expanded, as students begin to rely more heavily on portable devices (laptops, tablets, PDAs) for accessing and participating in course activities. In addition, a number of new facilities and approaches that were in their nascent stages in previous waves have expanded. These include:

1. learning analytics
2. adaptive or differentiated learning
3. expansion of competency-based instruction
4. open resources including material meant to replace traditional textbooks
5. gaming and multiuser virtual environments (MUVE).

All of the above, as well as traditional lectures, class discussions, laboratory work, internships, etc. that are typical in face-to-face classes, are at the disposal of faculty. In sum, the 4th Wave is categorized primarily as one where pedagogy is driving technology in a comprehensive and sophisticated blended learning environment relying on a variety of digital resources developed by individual faculty and teachers as well those provided by well-financed MOOC companies.

Brief review of the research

Online and blended learning approaches have rapidly become the focus of education research throughout the world. There are a number of journals such as The Internet and Higher Education (IHE), Online Learning (formerly the Journal of Asynchronous Learning Networks (JALN)), The International Review of Research in Open and Distance Learning, and the Journal of Online Learning and Teaching (JOLT) that devote themselves exclusively to issues and research related to the various modes of online instruction. Entire volumes (i.e., Picciano & Dziuban (2007); Picciano, Dziuban, & Graham (2014)) have focused on primary research on blended learning. A plethora of studies have been published that seek to explore the best practices, effectiveness, satisfaction, and challenges of teaching and learning online and in blended learning environments. For example, an extensive search of databases and citations for a meta-analysis project, returned 1,132 abstracts

on student outcomes in online and blended learning for the years 1996 to 2008. (U.S. DOE, 2010). These abstracts only reflected research in student outcomes, however, there are numerous other studies on faculty satisfaction, student access, and policy issues in online and blended learning environments.

In addition to formally published studies, numerous unpublished evaluations that are not indexed in public databases have been conducted by college and school administrators seeking to determine the effectiveness of online modalities in their own institutions. In sum, an extensive research base exists – yet because of the dynamic nature of instructional technology more research is still needed. In the remainder of this section, several key studies on blended learning issues will be presented. It is not meant to be an extensive review of the literature.

Student learning effectiveness

In 2007, the United States Department of Education (U.S. DOE) contracted with SRI International to conduct a meta-analysis of the effects of online and blended learning on student achievement. Barbara Means, the lead researcher for this project, acknowledged that the work was done by a team of staff members at SRI and named more than twenty individuals. The project was completed and a report published in 2010. As part of its work, the project team conducted a systematic search of the research literature published from 1996 through July 2008 and identified more than a thousand empirical studies of online and blended learning.

The overall finding of the meta-analysis was that classes using online technology on average produce stronger student learning outcomes than did classes with solely face-to-face instruction. The mean effect size for all 50 contrasts was +0.20, $p < .001$. (U.S.ED, p. 18) It is important to keep in mind that an effect size of +0.20 is considered small but is nonetheless positive. However, the researchers for the meta-analysis went a step further by separating the findings for fully-online versus blended learning and concluded that:

"A test of the difference between Category 1 and Category 2 studies found that the mean effect size was larger for contrasts pitting blended learning against face-to-face instruction (g+ = +0.35) than for those of purely online versus face-to-face instruction (g+ = +0.05); the difference between the two subsets of studies was statistically significant (Q = 8.37, p < .01)." (U.S.ED, p.12)

In other words, of the three modalities (face-to-face, fully online, and blended learning), blended learning had the highest learning outcomes. The report also added a significant caveat that some of the difference in the effects of blended learning might be attributed to more time on task than in fully-online or face-to-face instruction. Further study of this element of blended learning was recommended.

The U.S. Education Department meta-analysis is one of the most extensive reviews of learning effectiveness of online and blended learning conducted in the United States. It is generally viewed with a good deal of respect for the procedures and protocols followed throughout its inquiry.

Faculty attitudes

The results of research on faculty attitudes to online and blended learning has not been consistent and part of the problem appears to relate to differences in perceptions of those faculty who teach

online and blended learning courses as opposed to those who do not. Allen & Seaman (2012) in a survey of faculty in American colleges and universities concluded that the majority of faculty cast a skeptical eye on learning outcomes for online education. Nearly two-thirds said they believe that the learning outcomes for an online course are inferior or somewhat inferior to those for a comparable in-person course. However, the majority of faculty who teach online and blended courses indicated that online education can be as effective in helping students learn as in-person instruction.

In addition to perceptions of effectiveness, another significant faculty issue is one of workload. In the U.S. DOE (2010) meta-analysis mentioned above, an observation was made that students and faculty were possibly doing more work in blended learning courses than in other modalities to affect student learning. Ryan, Tynan, & Lamont-Mills (2014) conducted a study based on interviews of 88 faculty who teach online and blended courses in four Australian universities. The overwhelming response of the interviewees was that their workload increased and that the allocation system did not sufficiently account for the additional time required for teaching in fully online or blended modes. This study did not quantify work hours in e-teaching although one participant estimated that blended learning added 20 per cent to classroom instruction time; another posited it consumed double a face-to-face workload. One example of the increased workload was described as follows:

"I think it takes a lot longer for me to form a suitable reply online than it does for me to just spit out an answer [in a face-to-face course]. Because I spend a lot of time thinking 'how should I say it? Have I said that OK? Is someone going to take that the wrong way?' And I'll spend half an hour on a five minute question". (Ryan, Tynan, & Lamont-Mills, p. 278)

Administrative attitudes

Allen & Seaman have been conducting annual surveys of chief academic officers in American higher education for twelve years. Their data indicate that the attitudes of these officers have generally shown a positive trend to online and blended learning. In their latest study, the percent of academic leaders rating the learning outcomes in online education as the same or superior to those in face-to-face instruction had grown from 57 in 2003 to 74 percent in 2013. Furthermore, the majority (66%) of these officers saw online education as critical to their long-term strategy and assisting them in providing increased access for students to their programs (Allen & Seaman, 2014)

Earlier this year, the results of a survey commissioned by The Chronicle of Higher Education of American college presidents echoed the results of Allen & Seaman. An overwhelming majority of presidents—three quarters at private institutions and even more at public campuses—think that blended courses that contain both face-to-face and online components will have a positive impact on higher education. They were more skeptical, however, about MOOCs, at least in their current form. Half of the presidents surveyed suspect that MOOCs will have a negative impact on higher education. Furthermore, two-thirds of the presidents thought that external agents were driving too much of the change in higher education and they felt strongly that faculty should be the number one drivers of change. (Selingo, 2014)

In sum, this brief review indicates that there are mixed results in the research of online and blended learning. Student learning outcomes may be higher in blended environments but not much different in fully online and face-to-face courses. While the general faculty are skeptical, there are a large contingent of them who teach online and blended courses on a regular basis and see educational

value in these modalities. Administrators are supportive of online and blended learning and see them as important to their institutions, are willing to fund initiatives for development, and want to see faculty as the primary change leaders.

Research issues

Definition of blended learning

There are a number of critical issues that researchers face when conducting studies in online and blended learning. Perhaps the most significant relates to definitions especially with regard to blended learning which defies attempts to reach an agreement within the higher education community. Blended learning is not one thing but comes in many different flavors, styles, and applications. It means different things to different people.

The word "blended" implies a mixture more so than simply a combination of components. When a picture is pasted above a paragraph of text, a presentation is created that may be more informative to the viewer or reader, but the picture and text remain intact and can be individually discerned. On the other hand, when two cans of different colored paints are mixed, the new paint will look different from either of the original colors. In fact, if the new paint is mixed well, neither of the original colors will continue to exist. Similar situations exist in blended learning. The mix can be a simple separation of part of a course into an online component. For instance, a course that meets for three weekly contact hours, two hours might meet in a traditional classroom while the equivalent of one weekly hour is conducted online. The two modalities for this course are carefully separated and although they may overlap, they can still be differentiated.

In other forms of blended courses and programs, the modalities are not so easily distinguishable. Consider an online program that offers three online courses in a semester that all students are required to take. The courses meet for three consecutive five week sessions. However, students do a collaborative fifteen week project that overlaps the courses. The students are expected to maintain regular communication with one another through email and group discussion boards. They also are required to meet face-to-face once a month on Saturdays where course materials from the online courses are further presented and discussed, and some sessions are devoted to group project work. These activities begin to blur the modalities in a new mixture or blend where the individual parts are not as discernable as they once were.

Add to this, the increasing popularity of integrating videoconferencing, podcasting, Youtube videos, wikis, blogs, and social media into class work and the definition of blended learning becomes very fluid. In the broadest sense, blended learning can be defined or conceptualized as a wide variety of technology/media integrated with conventional, face-to-face classroom activities (see Figure 1). However, this conceptualization serves as a guideline and cannot be viewed as an absolute, limiting declaration. Also while it was developed to refer specifically to courses, it also can apply to entire academic programs.

Furthermore, because of all the possible approaches to blended learning, many of the findings of the research may apply only to local situations. This makes studies across institutions very difficult and prone to misinformation. An excellent review of models for blended learning research is provided by Graham, Henrie, & Gibbons (2014) and is highly recommended for further information.

Different colleges – Different cultures

While the definition of blended learning makes it difficult to generalize findings across institutions, inquiries should be cognizant of the type of college or university that is the setting for a study. This is especially true when conducting research on faculty and administrative issues. Colleges and universities have a range of cultures that influence the development of online learning and blended learning. Administrators in colleges with strong faculty governance and established collective bargaining traditions will tend to collaborate with instructional staff to encourage new course and program designs that take advantage of online technology. There have been a number of observations where faculty have resisted administrative calls for using online technology and have used governance and collective bargaining prerogatives to resist change.

The MOOC experiment at San Jose State University mentioned earlier in this article is a case in point. The proposal to develop several MOOC courses met a good deal of resistance on a number of issues and was subject to criticism on the part of faculty governance leaders. The California Faculty Association issued a three-page statement against the development of MOOCs at the University, against President Mohammed Qayoumi, and against Udacity and edX, the companies providing MOOC services.

Using fiery language, the statement said that San Jose State does not want "to be known as Wal-Mart U." That MOOC courses rather than providing greater access contribute to the digital divide and that the partnerships with Udacity and edX were designed "to put more money into the pockets of Silicon Valley entrepreneurs" at the expense of California taxpayers. The statement also was highly critical of how San Jose's President Qayoumi had ushered in the MOOCs. (Kolowich, 2013, California State Faculty Association, 2013) The MOOC experiment at San Jose was surely adversely affected by the actions of the faculty association. While the experiment was allowed to continue, it was looked upon with a good deal of skepticism.

Other higher education institutions where governance is minimal or non-existent encounter much less faculty resistance. Institutions such as some for-profit colleges that rely extensively on adjunct faculty who have minimal job security and serve at the pleasure of the administration, will encounter very little faculty resistance to calls for greater use of instructional technology. Faculty governance and collective bargaining are non-existent or weak. The culture at some of these institutions is that faculty – if they want to teach- have to follow directives including those associated with online learning development.

The grand debate – The medium v. message

There has been a grand debate in education research that goes back decades over the appropriateness of comparing instructional modalities. This debate is still relevant for present-day researchers attempting to compare a technology-infused environment with a traditional, face-to-face environment.

James Kulik and his associates at the University of Michigan were among the first researchers to conduct extensive reviews of the effects of technology on instruction. They conducted a series of meta-analyses in the 1970s and 1980s of hundreds of studies dealing with the effects of technology at different grade levels (elementary, secondary, college, and adult). Their general conclusion was that computer-based education had a beneficial effect on academic achievement, although it was not uniformly true at all grade levels and all subject areas (Kulik, 1984; Kulik, Bangert, & Williams,

1983; Kulik, Kulik, & Bangert-Downs, 1984; Kulik, Kulik, & Cohen, 1980; Kulik, Kulik, & Schwab, 1986).

Richard E. Clark (1983, 1985. 1989) refuted these findings by questioning the research controls used in most of the studies included those in the Kulik meta-analyses. Clark, however, went further and proposed that technology or any medium was basically a vehicle carrying an instructional substance and that real improvement in achievement only comes with improving the substance, not the vehicle. Unlike Marshall McLuhan's thesis that the "medium is the message", Clark posited that in education the message or content is the substance that matters. Clark's position has been challenged over the years by a number of researchers such as Robert Kozma (1991, 1994a, 1994b) and Jack Koumi (1994) who see the medium as integral to the delivery of instruction. The two differing opinions on this issue remain to this day and the "grand debate" continues. As an indication of the on-going nature and importance of this debate, a search of "Clark vs. Kozma" on Google provides over a million urls many of which refer to websites and blogs created in the past several years. Any current-day researcher contemplating the examination of the effects of technology on learning would be well-served by reading and rereading the articles by Clark, Kozma, and Koumi cited above. They provide valuable insight into the instructional technology issues.

Future Research

While there has been a plethora of studies, online and blended learning will remain prime foci of inquiry for years to come for a number of reasons. First, even though student experiences in using digital technology have been studied extensively, every time a new instructional technology is introduced, there is a flurry of research as courses and academic programs are redesigned and modified. In the past several years, new technological approaches and tools such as MOOCs, learning analytics, adaptive learning, and mobile computing have generated additional areas of inquiry. This cycle of change is fundamental to the evolution of digital technology and hence those involved in developing instructional applications that depend upon it will continue to experiment and study the new approaches. Research issues related to learning effectiveness, education access, persistence, and lifelong learning will continue to be important as faculty and administrators seek to accommodate growing numbers of students drawn to online education.

Second, faculty will be major-drivers of change in most public and non-profit colleges and universities. As indicated earlier in this article, presidents are looking for change to emanate from faculty in terms of teaching and learning. Large numbers of faculty have responded positively especially to the blended learning model where they can more easily maintain control of instruction. However, faculty governing bodies stand as important guardians of certain prerogatives and when necessary have exerted influence over institutional initiatives involving instructional technology. The interplay of faculty governance and administrative leadership over technology initiatives can result in public clashes of opinion as was the case with the introduction of MOOCs at San Jose State University.

However, the interplay is also manifesting itself in more subtle negotiations and compromises that would make for provocative research. In sum, the role of faculty governance in supporting or hindering instructional technology development is in need of careful, nuanced inquiries. There has been very little done in this area to date.

Third, college administrators appear convinced that online education and especially blended

learning are critical to their strategic planning. However, more study is needed in terms of funding and budgeting long-term support for online applications. Technology infrastructure, instructional design, and student support areas are among cost centers that need addressing to mount successful online course and program development.   Studies focusing on careful financial analyses and lessons learned are woefully missing and would be welcomed by the research community and by practitioners.

Lastly, researchers will be taking greater advantage of the variety of quantitative, qualitative, and mixed methodologies available for studying online education. Qualitative investigations can clear the way for the quantitative – and the quantitative can be suggestive of differences to be explored in a more interpretive, qualitative mode. Qualitative research unpeels meanings, concepts, contexts, descriptions, and settings, while quantitative research relies on measurements and counts. Qualitative research requires seeing, hearing, and experiencing activities in natural environments. Quantitative research requires a distancing from the object of study, while the sorting, counting, and analysis of numerical data are done away from their sources. Both are necessary and can be quite powerful when used in symbiotic research designs. Discourse and content analysis and phenomenology can be used to support quasi-experiments. Survey research can be used to expand the reach of institutional ethnographies.

Online education provides an incredible learning space for studying the subtle dynamics of teaching and learning. Instructional transactions and processes are recorded in convenient digital formats that are conducive for deep study and analysis. Researchers planning to do work in this area would be wise to develop and hone their methodological skills to take advantage of what the online environment provides. A treasure trove of data awaits them.

Conclusion

There is so much we don't know and even that which we feel we know changes and evolves as the technology changes, so the need for on-going investigation is a foregone necessity. Research is welcome that focuses on student, faculty, and administrative issues as related to online and blended learning. An attempt was made in this article to highlight some of the key issues related to this research. Online education has been a prime area for inquiry and will remain so for many years to come.

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